

SLOVENSKI STANDARD

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Železniške naprave - Energetski in krmilni kabli za železniška vozna sredstva, ki imajo posebne ognjevarne lastnosti - 1. del: Splošne zahteve

Railway applications - Railway rolling stock power and control cables having special fire performance -- Part 1: General requirements

Bahnanwendungen - Starkstrom- und Steuerleitungen für Schienenfahrzeuge mit verbessertem Verhalten im Brandfall -- Teil 1: Allgemeine Anforderungen

Applications ferroviaires - Câbles de puissance et de contrôle à comportement au feu spécifié pour matériel roulant ferroviaire -- Partie 1: Prescriptions générales

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29.060.20	Kabli	Cables
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EUROPEAN STANDARD
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EN 50264-1

June 2008

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Supersedes EN 50264-1:2002

English version

**Railway applications -
Railway rolling stock power and control cables
having special fire performance -
Part 1: General requirements**

Applications ferroviaires -
Câbles de puissance et de contrôle
à comportement au feu spécifié
pour matériel roulant ferroviaire -
Partie 1: Prescriptions générales

Bahnanwendungen -
Starkstrom- und Steuerleitungen
für Schienenfahrzeuge
mit verbessertem Verhalten im Brandfall -
Teil 1: Allgemeine Anforderungen

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This European Standard was approved by CENELEC on 2008-03-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

This European Standard was prepared by Working Group 12, Railway cables, of the Technical Committee CENELEC TC 20, Electric cables, as part of the overall programme of work in the Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50264-1 on 2008-03-01.

This European Standard supersedes EN 50264-1:2002.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2009-03-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2011-03-01

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Introduction

The railway industry is generally concerned with the movement of people as well as goods. It is therefore essential that a high level of safety is achieved, even when failures occur which may involve fire, howsoever caused, affecting railway rolling stock.

Hence it is necessary to provide cables for use in railway environments which minimise the hazard to people when a fire may damage the cable, irrespective of whether the fire is caused by an external source or from within the electrical system.

The EN 50264 series specifies cables for power, control and associated circuits which, in the event of fire, will limit the risk to people and improve the safety on railways in general. It covers sheathed and unsheathed cables with insulation and sheath based on halogen free materials, for use in railway rolling stock. In the event of a fire affecting cables to EN 50264 they will have a limited flame spread and limited emission of toxic gases. In addition these cables when burnt, produce limited amounts of smoke. This last characteristic will minimise loss of visibility in the event of a fire and will aid reduced evacuation times.

The objects of this standard are

- to standardise cables that are safe and reliable when properly used,
- to state the characteristics, performance, and construction requirements directly or indirectly bearing on safety,
- to specify methods for checking conformity with these requirements.

EN 50264, which covers a range of cables rated at up to 3,6/6 kV with conductor sizes 1,0 mm² up to 400 mm², is divided into 5 parts under the generic title “*Railway applications - Railway rolling stock power and control cables having special fire performance*”.

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- Part 1 General requirements;
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- Part 2-1 Cables with crosslinked elastomeric insulation – Single core cables;
- Part 2-2 Cables with crosslinked elastomeric insulation – Multicore cables;
- Part 3-1 Cables with crosslinked elastomeric insulation with reduced dimensions – Single core cables;
- Part 3-2 Cables with crosslinked elastomeric insulation with reduced dimensions – Multicore cables.

These cables are intended for a limited number of applications. Further information on these applications is given in the guide to use, i.e. EN 50355.

Information regarding selection and installation of cables, including current ratings can be found in EN 50355 and EN 50343. The procedure for selection of cable cross-sectional area, including reduction factors for ambient temperature and installation type, is described in EN 50343.

Special test methods referred to in EN 50264 are given in EN 50305.

A separate European Standard, EN 50306 (series), covers cables for similar applications but with thinner wall thickness of both insulation and sheath, leading to reduced overall cable diameters. These cables are restricted to 300 V rating and a maximum conductor size of 2,5 mm². A separate European Standard, EN 50382 (series), covers high temperature cables. The range of cables covered is rated at up to 3,6/6 kV with conductor sizes 1,5 mm² to 400 mm².

1 Scope

EN 50264-1 specifies the general requirements applicable to the cables given in all other parts of EN 50264. It includes the detailed requirements for the insulating and sheathing materials and other components called up in the separate parts. In particular EN 50264-1 specifies those requirements relating to fire safety.

Based on proven experience and reliability over many years these cables are rated for occasional thermal stresses causing ageing equivalent to continuous operational life at a conductor temperature of 90 °C.

NOTE This rating is based upon the polymers defined in 3.1 and 3.2. Before these polymers had gained widespread acceptance in the cable industry, ageing performance had been assessed via long-term thermal endurance testing and had been extrapolated to 20 000 h using techniques equivalent to those in EN 60216 (series). Subsequent experience in service has demonstrated that the predicted performance levels were correct. Where extrapolated data is used to predict lifetime in service it should be confirmed with the cable manufacturer, and should be on the basis of a failure mode appropriate to the type of material or cable.

The maximum conductor temperature for short circuit conditions is 200 °C based on a duration of 5 s.

This Part 1 should be read in conjunction with the other parts of EN 50264.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 10002-1	Metallic materials – Tensile testing – Methods of test at ambient temperature
EN 50264-2-1	Railway applications – Railway rolling stock power and control cables having special fire performance – Part 2-1: Cables with crosslinked elastomeric insulation – Single core cables
EN 50264-2-2	Railway applications – Railway rolling stock power and control cables having special fire performance – Part 2-2: Cables with crosslinked elastomeric insulation – Multicore cables
EN 50264-3-1	Railway applications - Railway rolling stock power and control cables having special fire performance – Part 3-1: Cables with crosslinked elastomeric insulation with reduced dimensions – Single core cables
EN 50264-3-2	Railway applications - Railway rolling stock power and control cables having special fire performance – Part 3-2: Cables with crosslinked elastomeric insulation with reduced dimensions – Multicore cables
EN 50266-2-4	Common test methods for cables under fire conditions – Test for vertical flame spread of vertically-mounted bunched wires or cables – Part 2-4: Procedures – Category C
EN 50266-2-5	Common test methods for cables under fire conditions – Test for vertical flame spread of vertically-mounted bunched wires or cables – Part 2-5: Procedures – Small cables – Category D
EN 50267-2-1	Common test methods for cables under fire conditions – Tests on gasses evolved during combustion of materials from cables – Part 2-1: Procedures – Determination of the amount of halogen acid gas
EN 50267-2-2	Common test methods for cables under fire conditions – Tests on gases evolved during combustion of materials from cables – Part 2-2: Procedures – Determination of degree of acidity of gases for materials by measuring pH and conductivity

EN 50305:2002	Railway applications – Railway rolling stock cables having special fire performance – Test methods
EN 60228	Conductors of insulated cables (IEC 60228)
EN 60332-1-2	Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame (IEC 60332-1-2)
EN 60684-2	Flexible insulating sleeving – Part 2: Methods of test (IEC 60684-2)
EN 60811-1-1:1995	Insulating and sheathing materials of electric and optical cables – Common test methods – Part 1-1: General application – Measurement of thickness and overall dimensions – Tests for determining the mechanical properties (IEC 60811-1-1:1993)
EN 60811-1-2:1995	Insulating and sheathing materials of electric cables – Common test methods – Part 1-2: General application – Thermal ageing methods (IEC 60811-1-2:1985 + A1:1989 + corr. May 1986)
EN 60811-1-3:1995	Insulating and sheathing materials of electric and optical cables – Common test methods – Part 1-3: General application – Methods for determining the density – Water absorption tests – Shrinkage test (IEC 60811-1-3:1993)
EN 60811-1-4:1995	Insulating and sheathing materials of electric and optical cables – Common test methods – Part 1-4: General application – Tests at low temperature (IEC 60811-1-4:1985 + A1:1993 + corr. May 1986)
EN 60811-2-1:1998	Insulating and sheathing materials of electric and optical cables – Common test methods – Part 2-1: Methods specific to elastomeric compounds – Ozone resistance, hot set and mineral oil immersion tests (IEC 60811-2-1:1998)
EN 61034-2	Measurement of smoke density of cables burning under defined conditions – Part 2: Procedure and requirements (IEC 61034-2)

3 Definitions

For the purposes of all parts of EN 50264, the following terms and definitions apply.

The types or combination of insulating and sheathing compounds covered in this EN are listed below.

3.1

cross-linked ethylene propylene rubber (EPR)

compound based on ethylene propylene rubber or similar (EPM or EPDM) which when cross-linked complies with the requirements given in the particular specification

3.2

cross-linked ethylene copolymers

compound in which the characteristic constituent is a copolymer of ethylene such as EVA or other, which, when cross-linked, complies with the requirements given in the particular specification

3.3

type of compound

category, designated by one or several characteristics, in which a compound is placed according to its properties, as determined by specific tests

NOTE The type designation is not directly related to the composition of the compound. See also 6.2.1 and 6.6.1.

3.4**halogen-free material**

combustible material which complies with the requirements of Annex A

3.5**variation**

difference between the median value after ageing and the median value without ageing, expressed as a percentage of the latter

3.6**type tests (symbol T)**

tests required to be made before supplying a type of cable covered by this standard on a general commercial basis in order to demonstrate satisfactory performance characteristics to meet the intended application

NOTE These tests are of such a nature that, after they have been made, they need not be repeated unless changes are made in the cable materials, design or type of manufacturing process which might change the performance characteristics

3.7**sample tests (symbol S)**

tests made on samples of completed cable, or components taken from a completed cable adequate to verify that the finished product meets the design specification

3.8**routine tests (symbol R)**

tests made on all complete cable lengths to demonstrate their integrity

4 Rated voltage

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The rated voltage of a cable is the reference voltage for which the cable is designed, and which serves to define the electrical tests.

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The rated voltage is expressed by the combination of the following values (in volts):

$$U_0/U(U_m)$$

where

U_0 is the r.m.s. value between any insulated conductor and earth, i.e. metal covering of the cable or the surrounding medium, e.g. $U_0 = 600$ V;

U is the r.m.s. value between any two phase-conductors of a multicore cable or of a system of single-core cables, e.g. $U = 1\ 000$ V;

U_m is the maximum r.m.s. value of the "highest system voltage" for which the equipment may be used, e.g. $U_m = 1\ 200$ V.

In an alternating current system, the rated voltage of a cable shall be at least equal to the nominal voltage of the system for which it is intended.

In a direct current system, the cables shall have a maximum voltage against earth (V_0) not exceeding 1,5 times the rated voltage (U_0) of the cable, where:

V_0 is the d.c. value between any insulated conductor and earth, i.e. metal covering of the cable or the surrounding medium, e.g. $V_0 = 900$ V.

The rated voltage recognized for the purposes of all parts of EN 50264 shall be as given in Table 1.

NOTE In the Railway Industry it is common practice to identify cables and systems by the value of U_o , not the more usual normal practice of U .

Table 1 – Rated voltages

Rated voltage V			
U_o	U	U_m	V_o
300 ^a	500 ^a	600 ^a	450 ^a
600	1 000	1 200	900
1 800	3 000	3 600	2 700
3 600	6 000	7 200	5 400
^a Multicore cables only.			
NOTE See Guide to use, EN 50355, for further information.			

5 Marking

5.1 Indication of origin

Cables shall be provided with an identification of origin consisting of the continuous marking of either manufacturer's name or trademark or registered identification number, by one of the following methods:

- 1) a printed tape within the cable; (standards.iteh.ai)
- 2) printing, indenting or embossing on the outer surface of sheathed cable; SIST EN 50264-1:2008
- 3) printing on the outer surface of single core cables; standards/sist/2a13904f-e42b-487b-90d9-a183f1332d74/sist-en-50264-1-2008
- 4) printing on the insulation of at least one core.

5.2 Code designation

The code designation is specified in the particular product EN.

5.3 Continuity of marks

Each specified mark shall be regarded as continuous if the distance between the end of the mark and the beginning of the next identical mark does not exceed

- a) 550 mm if the marking is on the outer surface of the cable,
- b) 275 mm if the marking is on the insulation or on a tape.

NOTE 1 A "specified mark" is any mandatory mark covered by this part of EN 50264 or by the particular requirements of Parts 2-1, 2-2, 3-1 and 3-2.

NOTE 2 An example of marking on the outer surface of the cable is given in Figure 1.

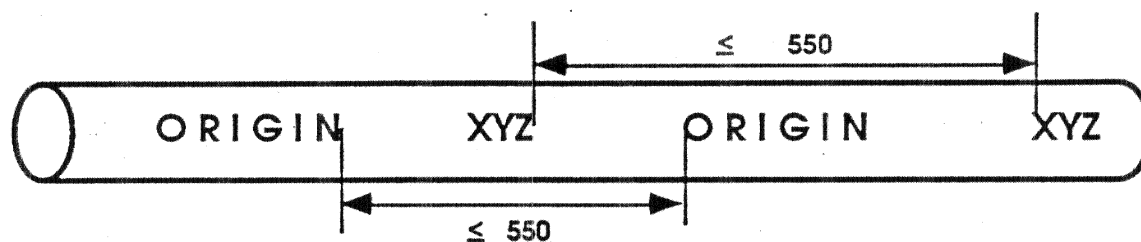


Figure 1 – Example of marking

Conformity shall be checked by visual examination and measurement.

5.4 Durability

Printed markings shall be durable. Compliance shall be checked by the test given in EN 50305, 10.1.

5.5 Legibility

All markings shall be legible.

Printed markings shall be in contrasting colours.

5.6 Use of the name CENELEC

The name CENELEC, in full or abbreviated, shall not be marked on, or in, the cables.

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6 General requirements for the construction of cables

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6.1 Conductors

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6.1.1 Material

The conductors shall be tin-coated annealed copper.

When tested in accordance with EN 10002-1 the minimum average elongation of the wires from the conductors shall be 15 %, with a minimum value of 10 % for an individual wire.

6.1.2 Construction

Conductors shall be in accordance with EN 60228.

NOTE The class of the conductor relevant to the various types of cable is given in EN 50264-2-1, EN 50264-2-2, EN 50264-3-1 and EN 50264-3-2.

6.1.3 Check of construction

Conformity with the requirements of 6.1.1 and 6.1.2 shall be checked by inspection and by measurement.

6.1.4 Electrical resistance

The resistance of each conductor at 20 °C shall be in accordance with the requirements of EN 60228 for the given class of conductor.

Compliance shall be checked by the test given in EN 50305, 6.1.

6.1.5 Separator tape

A non-hygroscopic separator tape of coloured material may be placed between the conductor and insulation. If used, the separator tape shall be easily removable from the conductor.

6.1.6 Conductor screening

Where specified in EN 50264-2-1 or EN 50264-3-1 the conductor screening shall consist of either a semi-conducting tape, or a layer of extruded semi-conducting compound, or a combination of both.

It shall be easily removable from the conductor.

6.2 Insulation system

6.2.1 Material

The insulation system shall be manufactured from materials as defined in either 3.1 or 3.2 of this part, or a combination of both. It shall conform to the requirements given in Table 2a or Table 2b and as specified below:

In Table 2a for Part 2-1 and Part 2-2 cables:

EI 101	low temperature resistant, oil resistant;
EI 102	extra low temperature resistant, oil resistant;
EI 103	low temperature resistant, extra oil and fuel resistant;
EI 104	extra low temperature resistant, extra oil and fuel resistant;
EI 105	extra low temperature resistant, non oil resistant.

In Table 2b for Part 3-1 and Part 3-2 cables:

EI 106	low temperature resistant, oil resistant;
EI 107	extra low temperature resistant, oil resistant;
EI 108	low temperature resistant, extra oil and fuel resistant;
EI 109	extra low temperature resistant, extra oil and fuel resistant;
EI 110	extra low temperature resistant, non oil resistant.

NOTE EI 105 and EI 110 are not fuel or acid/alkali resistant.

6.2.2 Multilayer insulation system

It is permitted to use types EI 105 and EI 110 as the inner layer of a multilayer insulation system, and types EI 101 to EI 104 and EI 106 to EI 109 as the outer layer of an insulation system. In the case of multilayer insulation systems, test pieces required for mechanical and related tests shall be prepared as given in Annex C.

6.2.3 Application

The insulation system shall be applied by extrusion and may consist of one or more closely adherent layers. The insulation system shall form a compact and homogeneous body and shall be so applied that it fits closely on the conductor or over the separator tape or over the conductor screening and it shall be possible to remove the insulation system without damage to the tinned conductor.

The insulation system shall be smooth, uniformly applied and substantially circular.

Conformity shall be checked by inspection and by manual testing.